

REMARKS

The present application was filed on March 12, 2001 with claims 1 through 28. Claims 9, 17, and 27 were cancelled in the Amendment and Response to Office Action dated September 17, 2004. Claims 1-8, 10-16, 18-26, and 28 are presently pending in the above-identified patent application. Claims 1-8, 10-16, 18-26, and 28 are proposed to be amended herein.

In the Office Action, the Examiner objected to claims 1-8, 10-16, 18-26, and 28 due to indicated informalities. The Examiner also rejected claims 1-8, 10, 19-26, and 28 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner rejected claims 1, 4-6, 10, 11, 14-16, and 18 under 35 U.S.C. §103(a) as being unpatentable over Kapoor (United States Patent Number 6,396,886) in view of Haddad et al. ("Design of Digital Linear-Phase FIR Crossover Systems of Loudspeakers by the Method of Vector Space Projections," Haddad, Khalil C.; hereinafter Haddad et al.), rejected claims 2 and 12 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, and in further view of Shinde (United States Patent Number 6,192,386), rejected claims 19, 22-24, and 28 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, and further in view of Gandhi et al. (United States Patent Number 6,112,218), rejected claim 20 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, in further view of Gandhi et al., and further in view of Shinde, rejected claims 1-8, 10-16, and 18 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, Khalil C. ("Constrained FIR Filter Design by the Method of Vector Space Projections," Haddad, Khalil C. et al.; hereinafter Kahlil – newly cited), and rejected claims 19-26 and 28 under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Khalil – newly cited, and in further view of Gandhi.

Claims 2, 12, and 20 have been amended to correct typographical errors.

Formal Objections

Claims 1-8, 10-16, 18-26, and 28 were objected due to indicated informalities. Regarding claims 10 and 18, the Examiner asserts that the time domain constraints and the frequency domain constraints would not converge to a set of

coefficients because they are exclusive of each other.

Claims 1-8, 10-16, 18-26, and 28 have been amended in accordance with the Examiner's suggestions. Regarding claims 10 and 18, Applicant notes that the algorithm disclosed in the present specification works by projecting successively on all the sets needed. These sets can be a combination of time domain sets and frequency domain sets. When a projection from a time domain set to a frequency domain (or vice versa) is performed, the Fast Fourier Transform (FFT) (time to frequency) and the Inverse Fast Fourier Transform (IFFT) (frequency to time) are used to switch between time to frequency domain and frequency to time domain (see, page 7, line 14, to page 8, line 2, of the originally filed specification). Thus, the time domain constraints and the frequency domain constraints would converge to one set of coefficients.

Applicant therefore respectfully requests that the objections to the claims be withdrawn.

Section 112 Rejections

Claims 1-8, 10, 19-26, and 28 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, the Examiner asserts that the determination of an intersecting set in line 8 is not definite because one skilled in the art is not able to determine what the intersecting set is comprised of. The claim language is unclear because it is not possible, as understood by one having skill in the art, to have overlapping time and frequency constraints because the time domain constraints and the frequency domain constraints are mutually exclusive by definition. Therefore, with this possible interpretation of the intersecting set removed, one skilled in the art is unable to determine what an intersecting set would be comprised of.

As noted above, the algorithm disclosed in the present specification works by projecting successively on all the sets needed. These sets can be a combination of time domain sets and frequency domain sets. When a projection from a time domain set to a frequency domain (or vice versa) is performed, the Fast Fourier Transform (FFT) (time to frequency) and the Inverse Fast Fourier Transform (IFFT) (frequency to time) are used to switch between time to frequency domain and frequency to time domain.

Thus, the time domain constraints and the frequency domain constraints would converge to one set of coefficients and the determination of an intersecting set is definite.

Applicant respectfully requests that the section 112 rejections be withdrawn.

Independent Claims 1, 11 and 19

Independent claims 1 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad et al. and claim 19 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, and further in view of Gandhi et al. Independent claims 1 and 11 were also rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Khalil – newly cited, and claim 19 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Khalil – newly cited, and in further view of Gandhi. Regarding claim 1, the Examiner asserts that Kapoor discloses establishing at least one set defining constraints that said SIRF filter must satisfy in a frequency domain (col. 4, lines 10-13; col. 6, lines 58-63).

Applicants note that the concepts of sets, intersection of sets and projections are not disclosed or suggested by Kapoor. In SIRF filter design, constraints in the time domain are needed in general to prevent spectral nulls to show up in the solution of the coefficients. Kapoor's method does not introduce sets in the frequency domain; instead Kapoor introduces an artificial noise in the time domain that is added to the cost function in the time domain. Therefore, Kapoor puts constraints on the energy of noise and coefficients lumped together in the *time domain*, and then solves for the coefficients in the *time domain*. (The addition of noise to the cost function to prevent spectral nulls from occurring is a different approach than Haddad's method which relies on adding linear or non-linear constraints in the frequency domain directly to prevent spectral nulls. The method taught by Haddad switches from the time domain to frequency domain (and vice versa) using FFT and IFFT algorithms; the algorithm disclosed by Kapoor is solved in the *time domain only*.) Independent claims 1, 11, and 19 have been amended to require establishing at least one set of defining constraints that said SIRF filter must satisfy in a time domain; establishing at least one set of defining constraints that said SIRF filter must satisfy in a *frequency domain*; and determining an intersecting set of said at least one set of defining constraints that said SIRF filter must

satisfy in the time domain and said at least one set of defining constraints that said SIRF filter must satisfy in the *frequency domain* by employing vector space projection methods.

Applicant also notes that Gandhi is directed to a digital filter having a recursive path in which reduced precision adder circuitry can be utilized without increasing quantization error. Gandhi does not address the issue of determining an intersecting set of at least one set of defining constraints that a SIRF filter must satisfy in the time domain and at least one set of defining constraints that the SIRF filter must satisfy in the frequency domain by employing vector space projection methods.

Thus, Kapoor, Gandhi et al., and Haddad et al., alone or in any combination, do not disclose or suggest establishing at least one set of defining constraints that said SIRF filter must satisfy in a time domain; establishing at least one set of defining constraints that said SIRF filter must satisfy in a frequency domain; and determining an intersecting set of said at least one set of defining constraints that said SIRF filter must satisfy in the time domain and said at least one set of defining constraints that said SIRF filter must satisfy in the frequency domain by employing vector space projection methods, as required by independent claims 1, 11, and 19, as amended.

Additional Cited References

Shinde was also cited by the Examiner for its disclosure of an analogous digital finite impulse response (FIR) filter that does not produce any phase distortion. Applicant notes that Shinde is directed to a digital filter which has a feature of processing by interpolating digital signals x times (col. 1, lines 30-34). Shinde does not address the issue of determining an intersecting set of at least one set of defining constraints that a SIRF filter must satisfy in the time domain and at least one set of defining constraints that the SIRF filter must satisfy in the frequency domain by employing vector space projection methods.

Thus, Shinde does not disclose or suggest establishing at least one set of defining constraints that said SIRF filter must satisfy in a time domain; establishing at least one set of defining constraints that said SIRF filter must satisfy in a frequency domain; and determining an intersecting set of said at least one set of defining constraints

that said SIRF filter must satisfy in the time domain and said at least one set of defining constraints that said SIRF filter must satisfy in the frequency domain by employing vector space projection methods, as required by independent claims 1, 11, and 19, as amended.

5 Dependent Claims 2-8, 10, 12-16, 18, 20-26 and 28

Dependent claims 4-6, 10, 14-16, and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad et al., claims 2 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, and in further view of Shinde, claims 22-24 and 28 were rejected under 35
10 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, and further in view of Gandhi et al., claim 20 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Haddad, in further view of Gandhi et al., and further in view of Shinde, claims 2-8, 10, 12-16, and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Khalil – newly cited, and claims 20-26 and
15 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kapoor in view of Khalil – newly cited, and in further view of Gandhi.

Claims 2-8 and 10, claims 12-16 and 18, and claims 20-26 and 28 are dependent on claims 1, 11, and 19, respectively, and are therefore patentably distinguished over Kapoor, Haddad et al., Shinde, Khalil – newly cited, and Gandhi et al.
20 (alone or in any combination) because of their dependency from amended independent claims 1, 11, and 19 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

All of the pending claims, i.e., claims 1-8, 10-16, 18-26, and 28, are in condition for allowance and such favorable action is earnestly solicited.

25 If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,



Kevin M. Mason
Attorney for Applicants
Reg. No. 36,597
Ryan, Mason & Lewis, LLP
1300 Post Road, Suite 205
Fairfield, CT 06824
(203) 255-6560

Date: April 19, 2005

5

10